

Source Water Protection Planning in a Shallow Alluvial Aquifer



Samuel Iwenofu



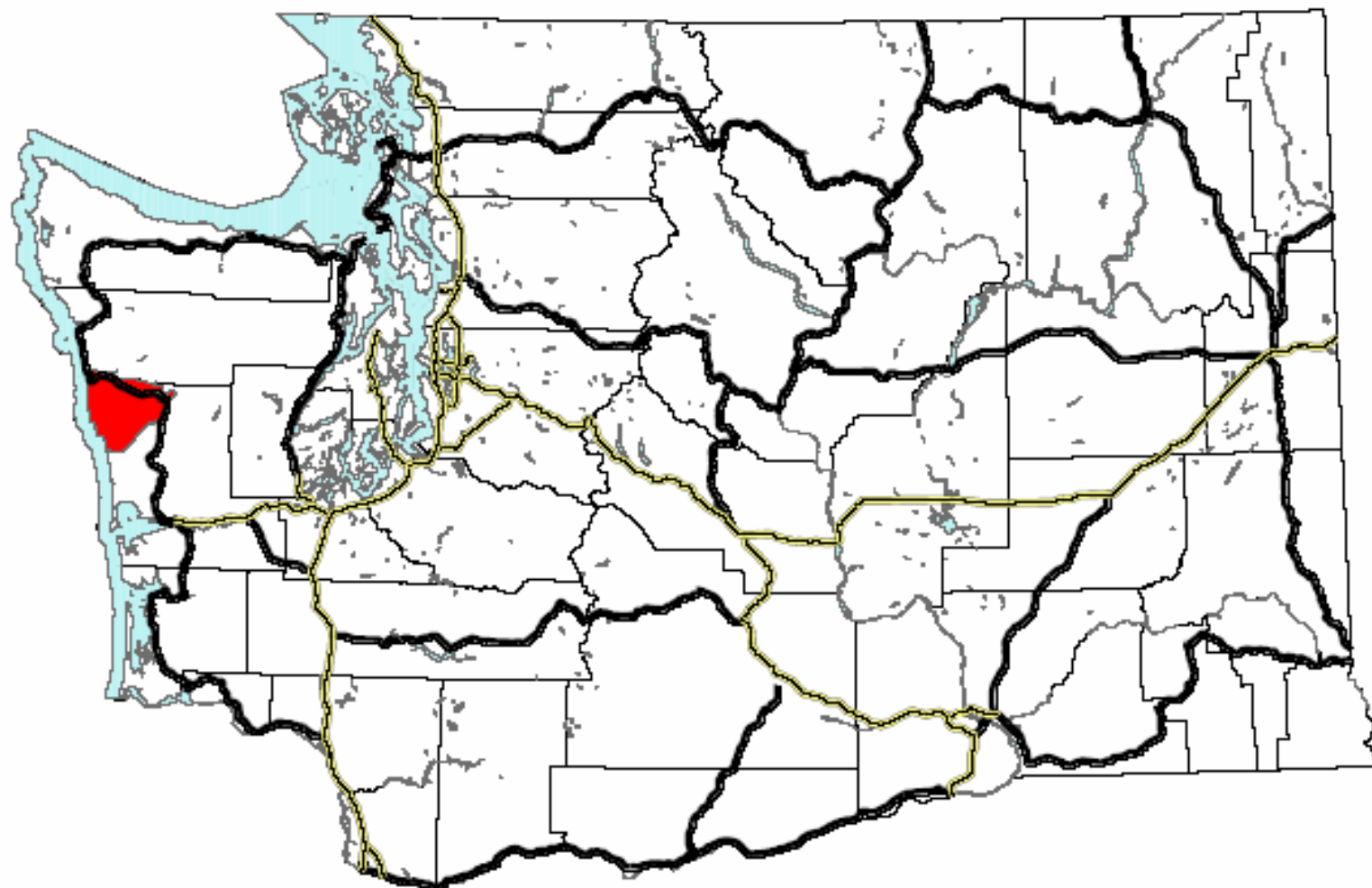
Dale Becker

Overview

- **Introduction**
- **Delineation**
- **Potential Contaminant Inventory**
- **Risk Assessment**
- **BMP Development**
- **Plan Implementation**

Introduction

- **History**
 - **Water Source**
 - **Arbitrary Radius**
 - **Need for more detailed planning**



Legend

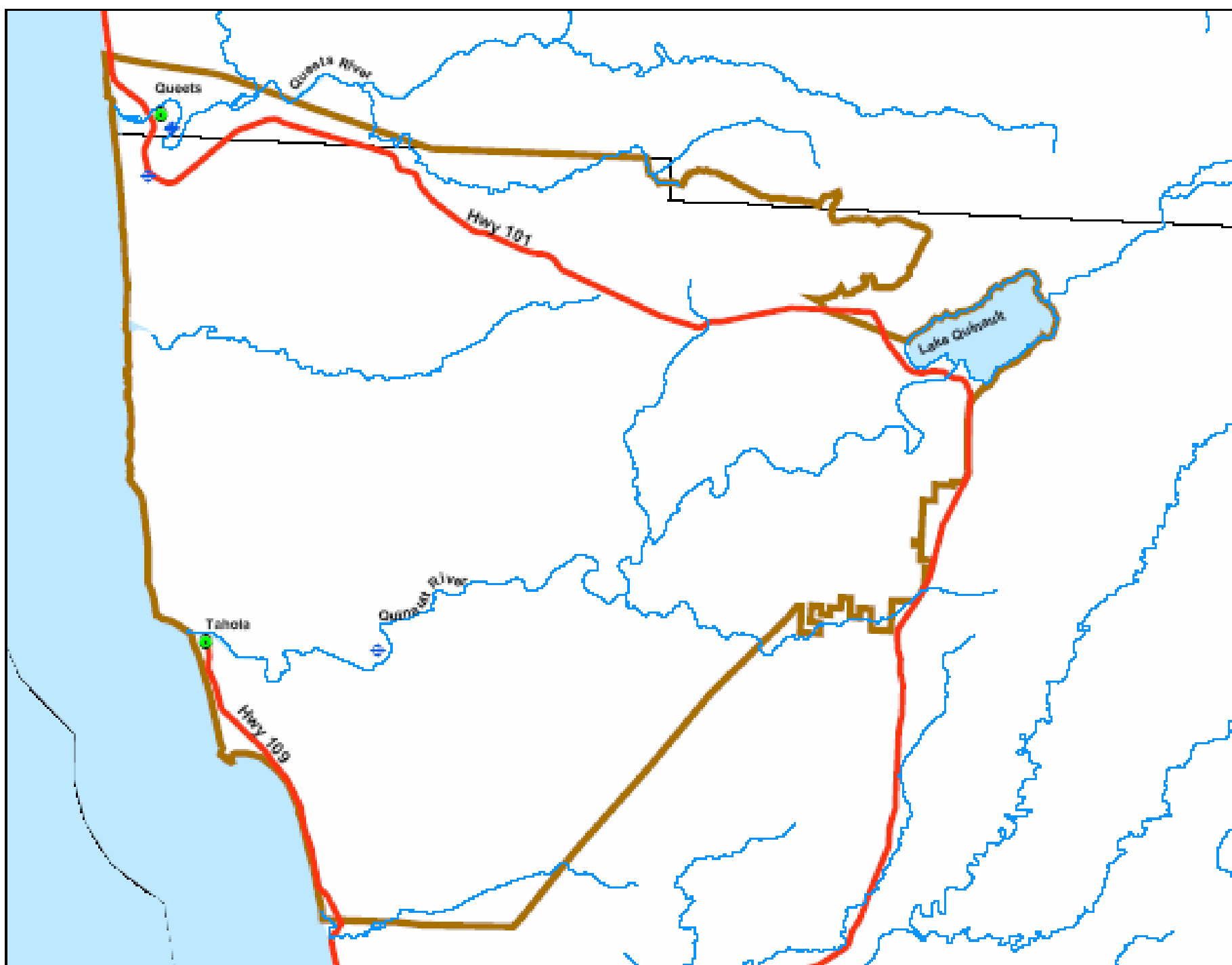
- Freeway
- Highway

Quinault Indian Reservation

Water

County

0 15 30 60 90 120 Miles



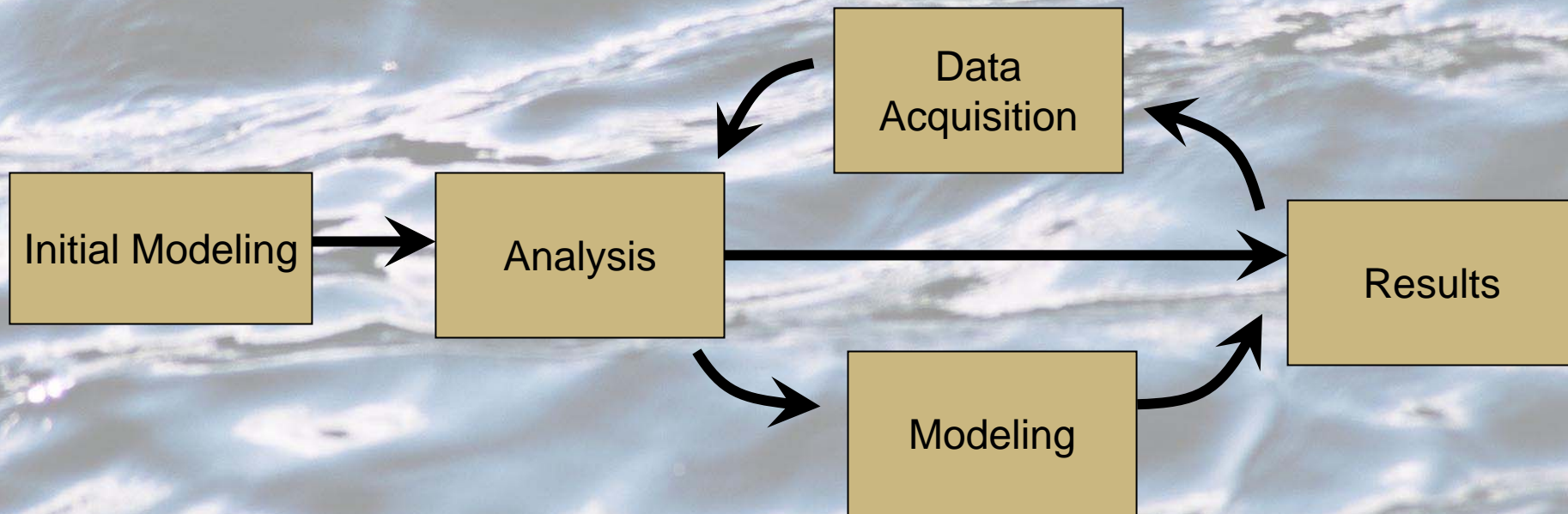
Source Water Assessment

- **To identify the risk of contamination to a drinking water source through:**
 - **Delineation of protection zones**
 - **Inventory of potential contaminant sources**
 - **Risk assessment**
 - **Disclose risk to the public**

Source Water Protection

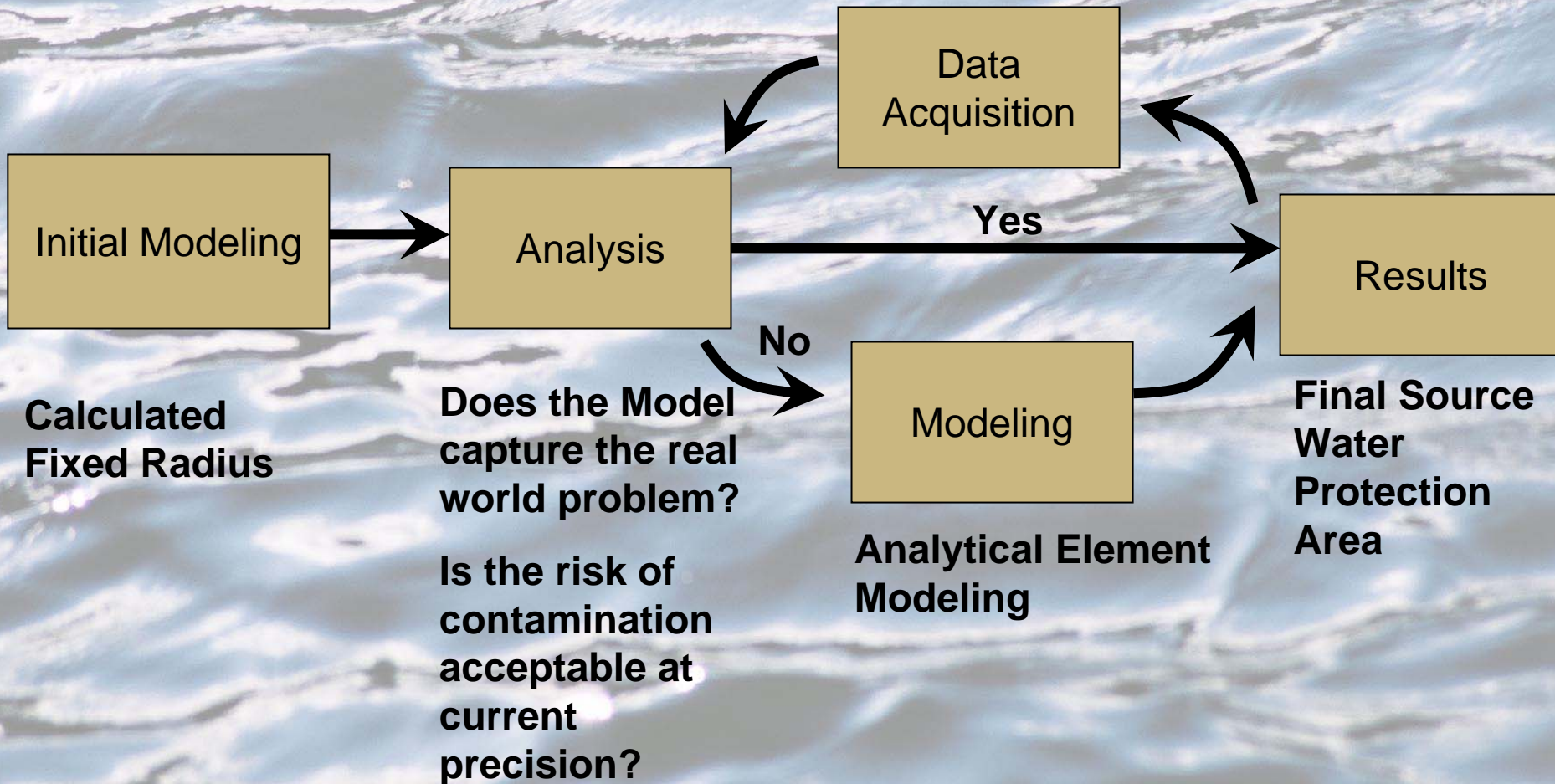
- **To reduce the risk of contamination by:**
 - **Managing the source water protection areas**
 - **Emergency planning**

Stepwise Delineation



Adapted From: H. M. Haitjema, Analytical Element Modeling of Groundwater Flow, Academic Press, San Diego, Ca, 1995, p248.

Modeling Process



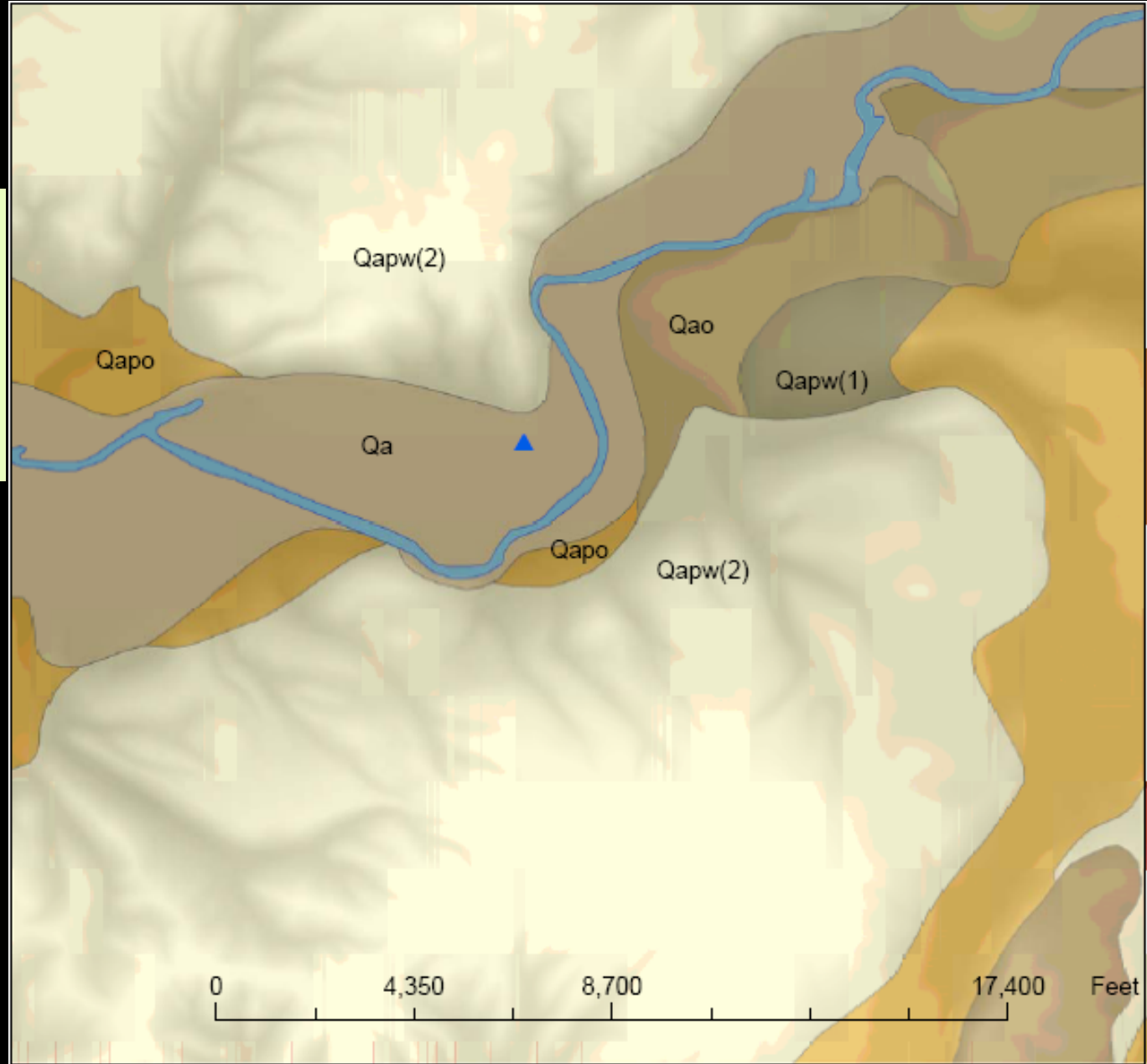
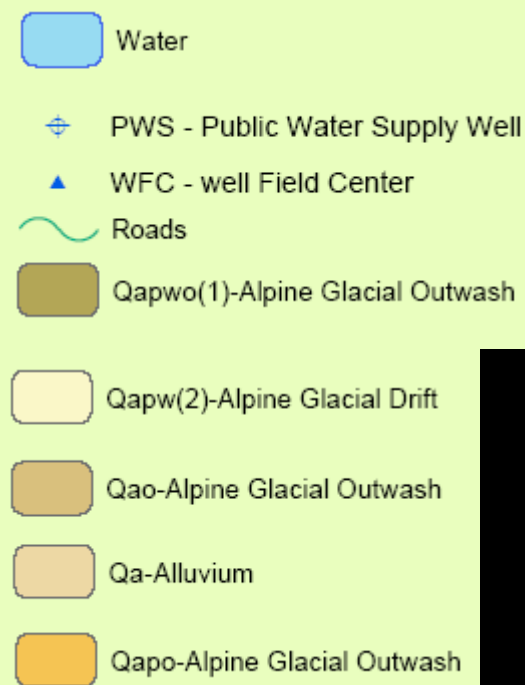
Model Details

Calculated Fixed Radius

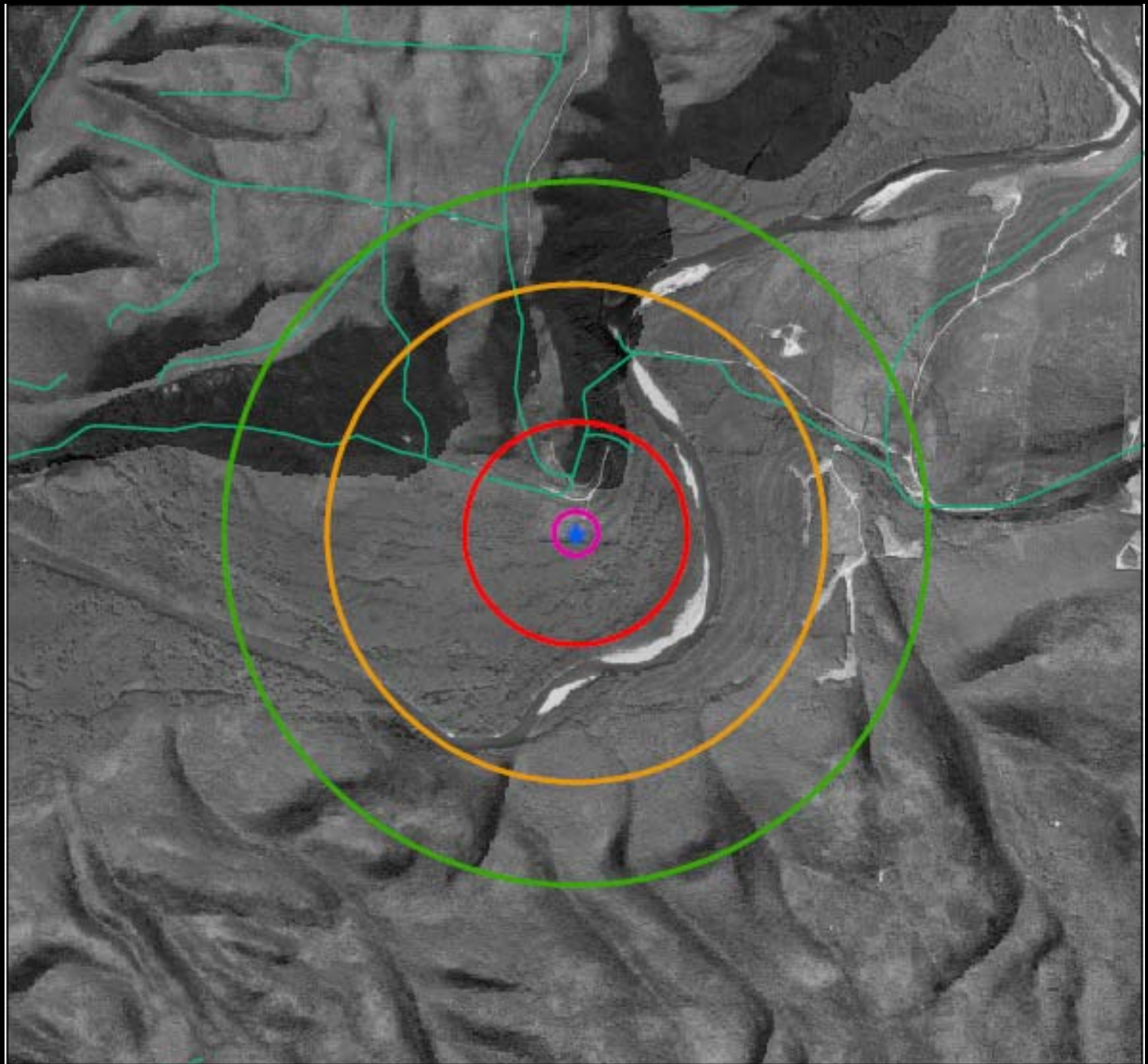
- Steady State
- Homogeneous
- No Recharge
- No Aquifer Gradient

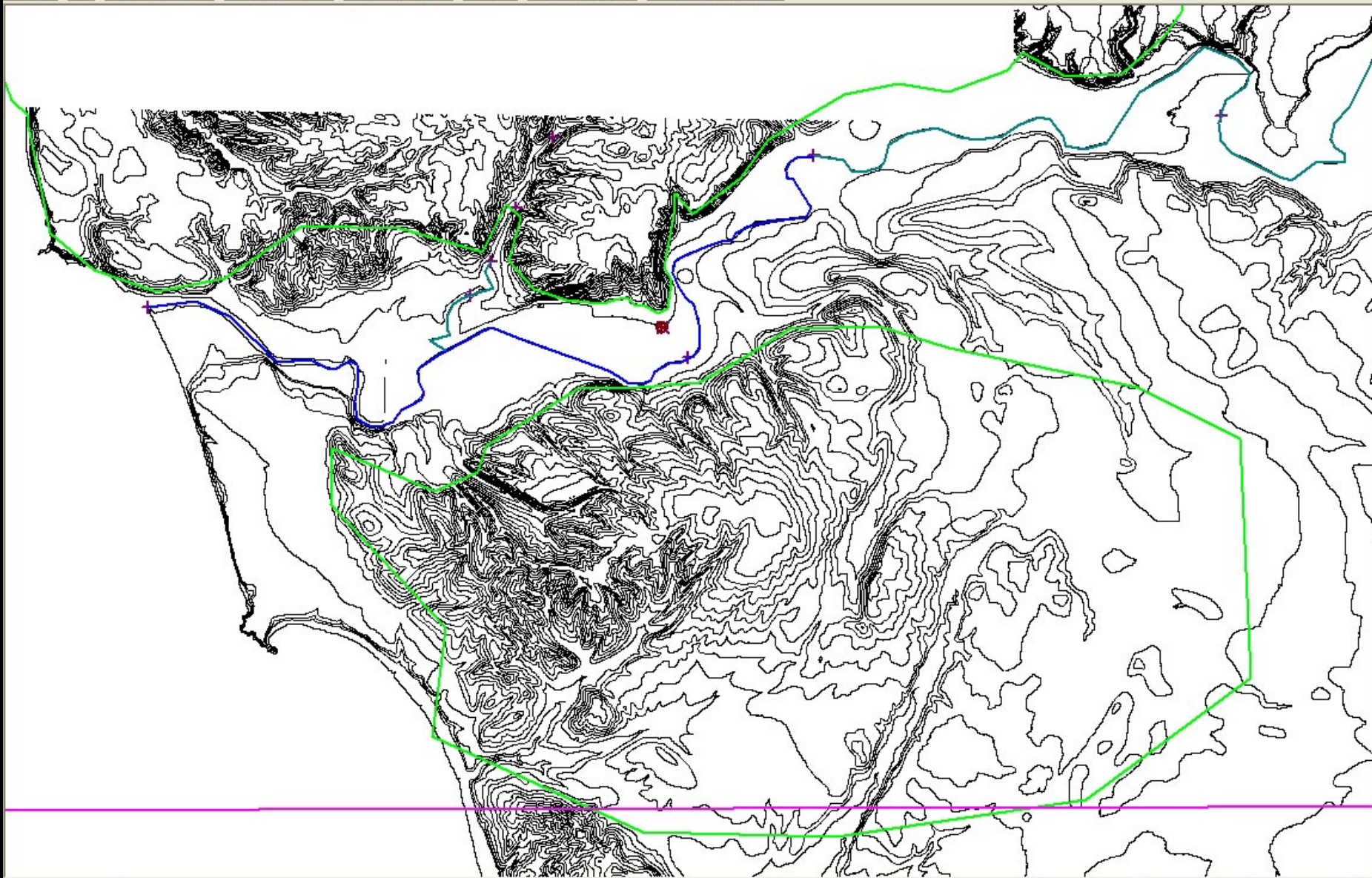
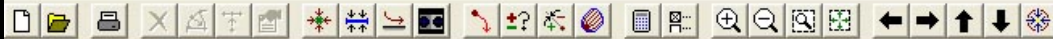
WhAEM 2000

- Steady State
- Heterogeneous
- Recharge
- Modeled Gradient



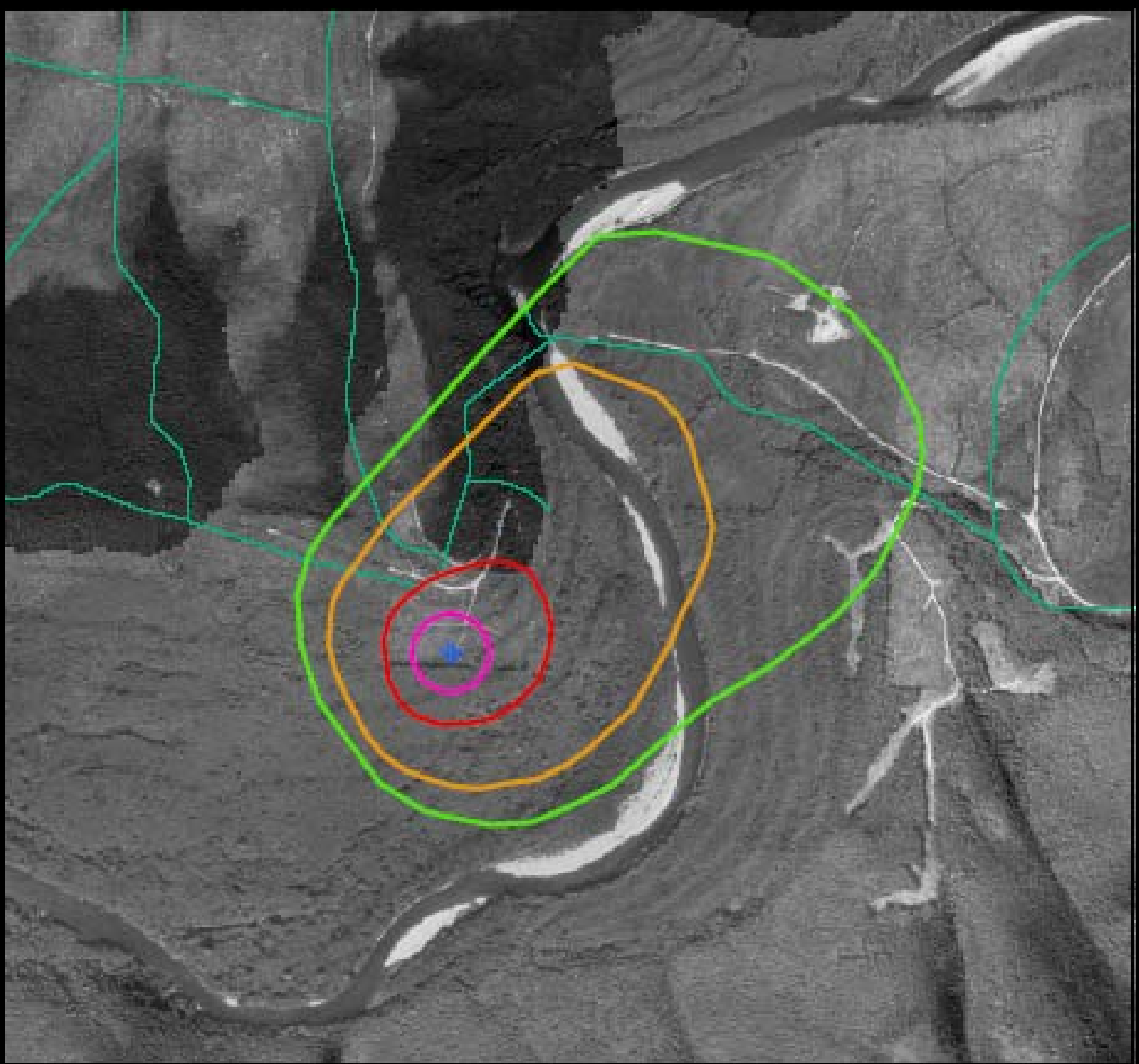
Source: Harris, Carl F. T. and Schuster, J. Eric, 1:100,000 Scale Digital Geology of Washington State, Washington State Department of Natural Resources, Division of Geology and Earth Resources, 2000.





Select Click mouse button to select element

418,687.3 m 5,241,665.6 m



Legend

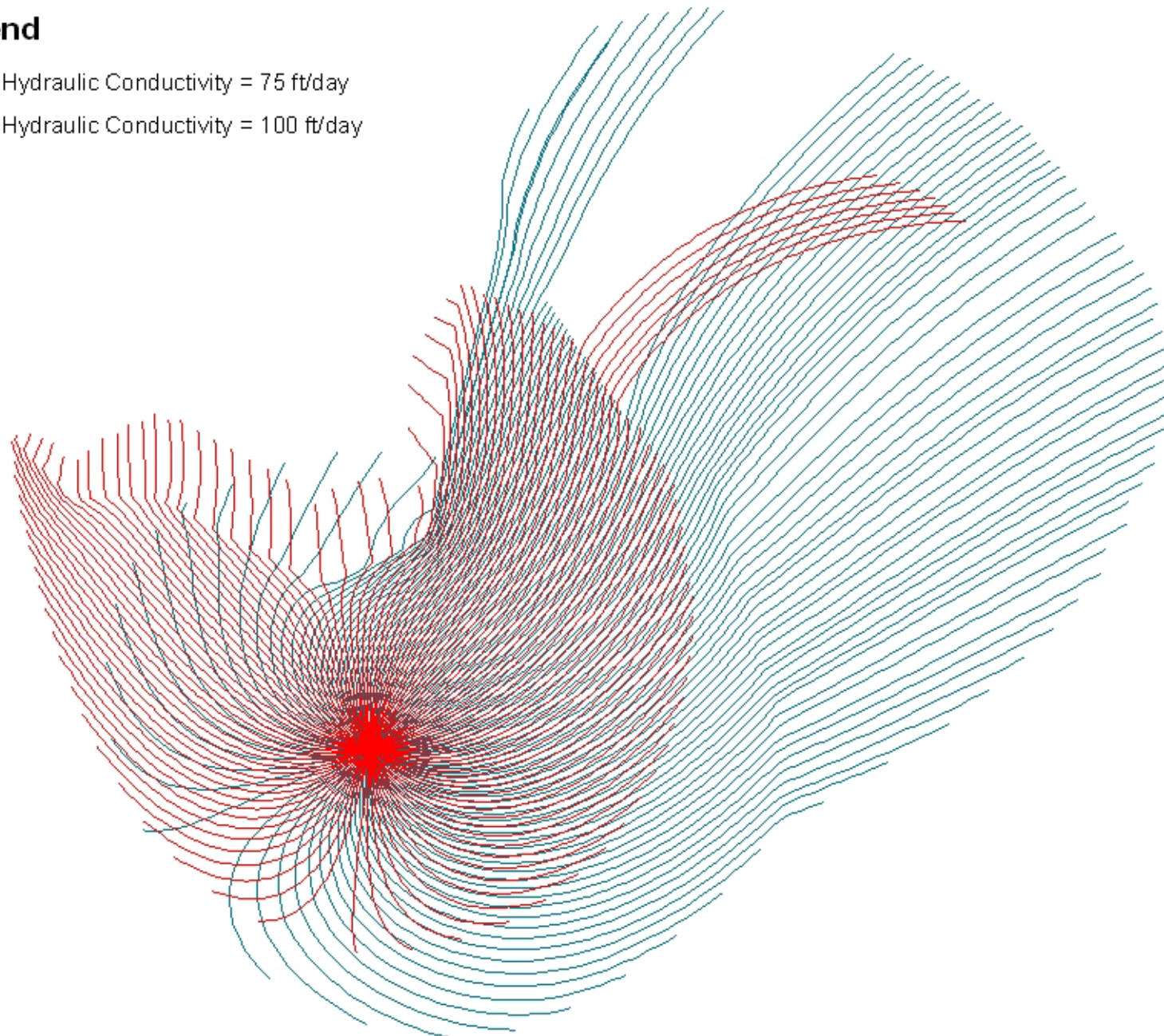
- k 1000
- k = 1476
- k = 400
- k = 600
- k = 800
- k = 75
- K = 100
- k = 200



Legend

— Hydraulic Conductivity = 75 ft/day

— Hydraulic Conductivity = 100 ft/day



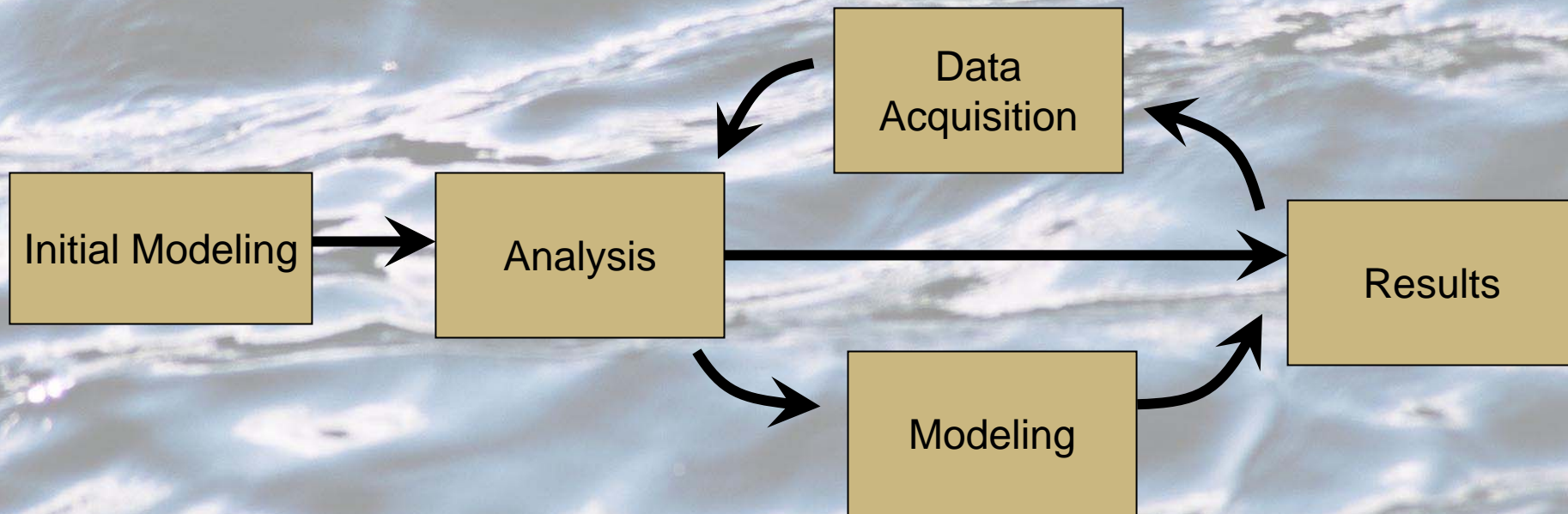
Potential Contaminant Sources

- **Quinault River**
- **River Recreation**
- **Forestry**

Risk of Contamination

- **Aquifer Properties – High Risk**
- **Land Use - Moderate Risk**
- **Well Integrity – Low Risk**

Stepwise Delineation

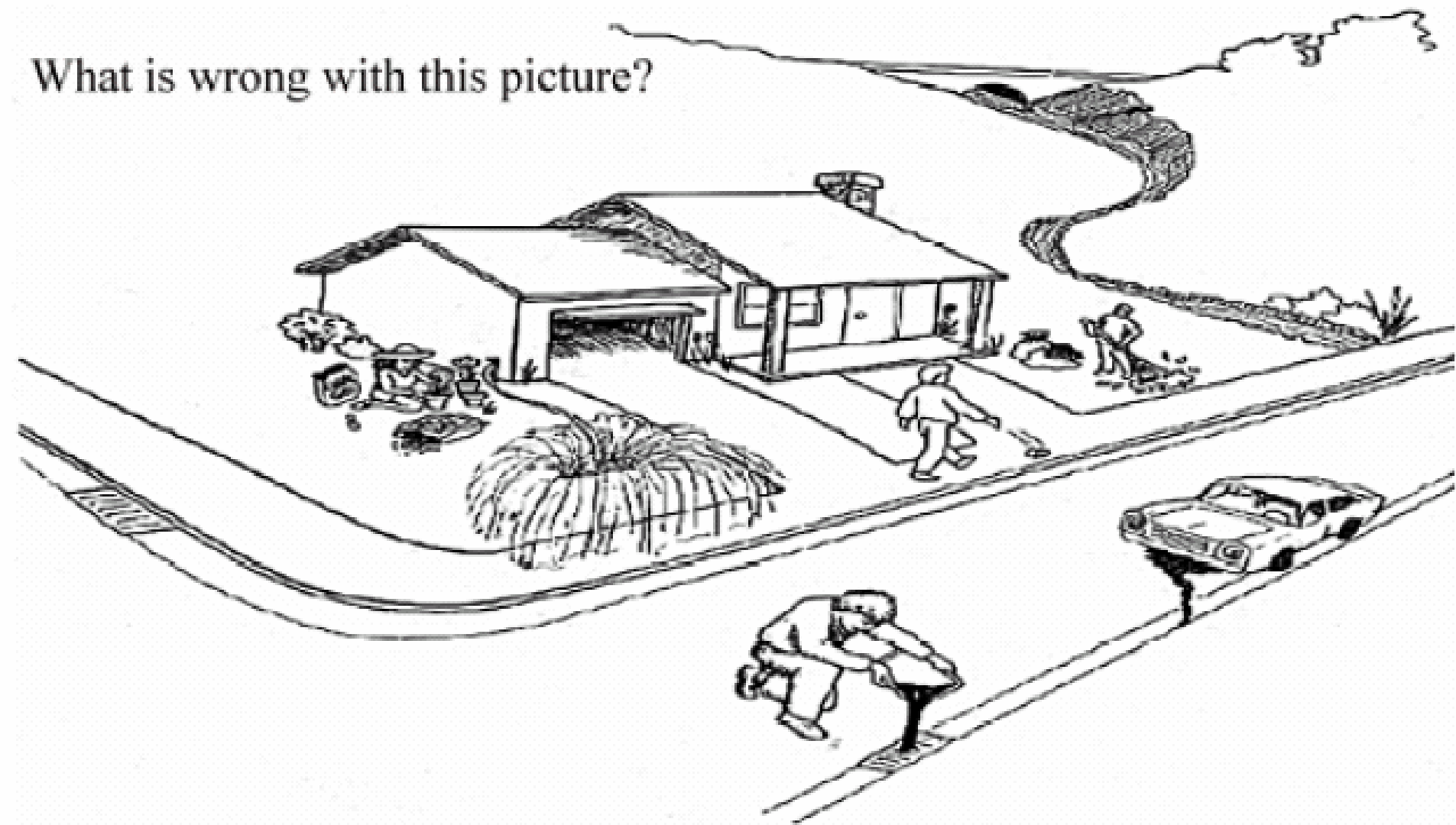


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Management & BMPs

- **Cleanup of Illegal Dump Site in Watershed**
- **Forestry BMPs Dependant on Business Council Decision between:**
 - **No change in typical forest management**
 - **Designated Equipment Fueling Areas and Reduced Equipment Use**
 - **No Harvest in 1 year Time of Travel Zone**
 - **Ban on harvest in the 5 year time of travel zone**
 - **No Harvest Without a More Sophisticated Model**
- **Public Education**

What is wrong with this picture?



Implementation?

- **Business Council Decision**